

WHAT IS CLAIMED IS:

1. A liquid crystal display apparatus, comprising:

a pair of substrates; and

a liquid crystal layer having negative dielectric anisotropy sandwiched by the pair of substrates;

wherein: electrodes are provided on each of the pair of substrates, each pixel being defined by an electrode on one of the pair of substrate and a corresponding electrode on the other of the pair of substrates;

liquid crystal molecules in the liquid crystal layer are oriented in a direction substantially perpendicular to a substrate surface in the absence of an applied voltage, are oriented in a direction substantially parallel to the substrate surface in the presence of an applied predetermined voltage, and are oriented in a slanting direction with respect to the substrate surface in the presence of an applied voltage less than the predetermined voltage;

each of the electrodes provided on at least one of the pair of substrates has at least first and second tilted surfaces facing directions different from a direction substantially perpendicular to the substrate

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surface and being adjacent to each other; and

an insulating film is provided on a liquid crystal molecule side of the electrodes provided on the at least one of the pair of substrates to bury the tilted surfaces of the electrodes to produce a flat surface of the at least one of the pair of substrates.

2. A liquid crystal display apparatus according to claim 1, wherein another insulating film comprising predetermined protrusions, pits, or a pit-and-protrusion pattern having at least first and second tilted surfaces are provided on a liquid crystal layer side of the at least one of the pair of substrates so that the electrodes provided on the at least one of the pair of substrates are provided on the other insulating film while the first and second tilted surfaces of the other insulating film are maintained.

3. A liquid crystal display apparatus according to claim 2, wherein the first and second tilted surfaces of each of the electrodes provided on the at least one of the pair of substrates are provided for a corresponding pixel, and liquid crystal molecules in the corresponding pixel are tilted in directions different from a direction

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substantially perpendicular to the substrate surface, the directions being separated by a boundary between the first and second tilted surfaces.

4. A liquid crystal display apparatus according to claim 2, wherein the other insulating film also serves as a vertical alignment film provided by subjecting surfaces of the pair of substrates to vertical alignment treatment.

5. A liquid crystal display apparatus according to claim 3, wherein the other insulating film also serves as a vertical alignment film provided by subjecting surfaces of the pair of substrates to vertical alignment treatment.

6. A liquid crystal display apparatus according to claim 2, wherein:

each of the electrodes provided on the at least one of the pair of substrates further has at least third and fourth tilted surfaces adjacent to each other and facing directions different from the directions of the first and second tilted surfaces and the direction substantially perpendicular to the substrate surface; and

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a boundary between the first and second tilted surfaces and a boundary between the third and fourth tilted surfaces are oriented to directions different from each other in a plane parallel to the substrate surface.

7. A liquid crystal display apparatus according to claim 4, wherein:

each of the electrodes provided on the at least one of the pair of substrates further has at least third and fourth tilted surfaces adjacent to each other and facing directions different from the directions of the first and second tilted surfaces and the direction substantially perpendicular to the substrate surface; and

a boundary between the first and second tilted surfaces and a boundary between the third and fourth tilted surfaces are oriented to directions different from each other in a plane parallel to the substrate surface.

8. A liquid crystal display apparatus according to claim 1, wherein the first and second tilted surfaces of each of the electrodes provided on the at least one of the pair of substrates are provided for a corresponding pixel, and liquid crystal molecules in the corresponding pixel are tilted in directions different from a direction

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substantially perpendicular to the substrate surface, the directions being separated by a boundary between the first and second tilted surfaces.

9. A liquid crystal display apparatus according to claim 1, wherein the other insulating film also serves as a vertical alignment film provided by subjecting surfaces of the pair of substrates to vertical alignment treatment.

10. A liquid crystal display apparatus according to claim 1, wherein:

each of the electrodes provided on the at least one of the pair of substrates further has at least third and fourth tilted surfaces adjacent to each other and facing directions different from the directions of the first and second tilted surfaces and the direction substantially perpendicular to the substrate surface; and

a boundary between the first and second tilted surfaces and a boundary between the third and fourth tilted surfaces are oriented to directions different from each other in a plane parallel to the substrate surface.

11. A liquid crystal display apparatus according to

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claim 1, wherein the first and second tilted surfaces of each of the electrodes provided on the at least one of the pair of substrates are adjacent to each other to form a protrusion, an apex portion of the protrusion facing the liquid crystal layer, and a boundary between the first and second tilted surfaces are exposed from the insulating film to the liquid crystal layer.

12. A liquid crystal display apparatus according to claim 11, wherein the other insulating film also serves as a vertical alignment film provided by subjecting surfaces of the pair of substrates to vertical alignment treatment.

13. A liquid crystal display apparatus according to claim 11, wherein:

each of the electrodes provided on the at least one of the pair of substrates further has at least third and fourth tilted surfaces adjacent to each other and facing directions different from the directions of the first and second tilted surfaces and the direction substantially perpendicular to the substrate surface; and

a boundary between the first and second tilted surfaces and a boundary between the third and fourth

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tilted surfaces are oriented to directions different from each other in a plane parallel to the substrate surface.

14. A liquid crystal display apparatus according to claim 12, wherein:

each of the electrodes provided on the at least one of the pair of substrates further has at least third and fourth tilted surfaces adjacent to each other and facing directions different from the directions of the first and second tilted surfaces and the direction substantially perpendicular to the substrate surface; and

a boundary between the first and second tilted surfaces and a boundary between the third and fourth tilted surfaces are oriented to directions different from each other in a plane parallel to the substrate surface.

15. A method for producing a liquid crystal display apparatus comprising a pair of substrates and a liquid crystal layer having negative dielectric anisotropy sandwiched by the pair of substrates, wherein electrodes are provided on each of the pair of substrates, each pixel being defined by an electrode on one of the pair of substrate and a corresponding electrode on the other of the pair of substrate, and liquid crystal molecules in

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the liquid crystal layer are oriented in a direction substantially perpendicular to a substrate surface in the absence of an applied voltage, are oriented in a direction substantially parallel to the substrate surface in the presence of an applied predetermined voltage, and are oriented in a slanting direction with respect to the substrate surface in the presence of an applied voltage less than the predetermined voltage,

in production of one of the pair of substrates, which is an active matrix substrate, the method comprising the step of:

forming a plurality of active elements and a plurality of electrode lines on the one of the pair of substrates, forming a conductive film on the resultant substrate, and subjecting the conductive film to patterning, thereby providing the pixel electrodes on the one of the pair of substrates, wherein each of the pixel electrodes has at least first and second tilted surfaces facing directions different from a direction substantially perpendicular to the substrate surface and being adjacent to each other, and is connected to electrodes of the active elements; and

forming an insulating film on the pixel electrodes to bury the first and second tilted surfaces of the pixel

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electrodes to produce a flat surface of the one of the pair of substrates.

16. A method for producing a liquid crystal display apparatus comprising a pair of substrates and a liquid crystal layer having negative dielectric anisotropy sandwiched by the pair of substrates, wherein electrodes are provided on each of the pair of substrates, each pixel being defined by an electrode on one of the pair of substrate and a corresponding electrode on the other of the pair of substrate, and liquid crystal molecules in the liquid crystal layer are oriented in a direction substantially perpendicular to a substrate surface in the absence of an applied voltage, are oriented in a direction substantially parallel to the substrate surface in the presence of an applied predetermined voltage, and are oriented in a slanting direction with respect to the substrate surface in the presence of an applied voltage less than the predetermined voltage,

in production of one of the pair of substrates, which is an active matrix substrate, the method comprising the step of:

forming a plurality of active elements and a plurality of electrode lines on the one of the pair

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of substrates, forming a first insulating film on the resultant substrate, and subjecting the first insulating film to patterning, thereby providing predetermined protrusions, pits, or a pit-and-protrusion pattern having at least first and second tilted surfaces facing directions on a liquid crystal layer side of the resultant substrate, while forming contact holes in the first insulating film;

forming a conductive film on the first insulating film wherein the first and second tilted surfaces of the first insulating film are maintained;

patterning the conductive film in such a manner as to overlap the active elements and the electrode lines and to be connected to electrodes of the active elements, thereby forming the pixel electrodes; and

forming a second insulating film on the pixel electrodes to bury the first and second tilted surfaces of the pixel electrodes to produce a flat surface of the one of the pair of substrates.

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